

WE CLAIM:

1. A coupling between first and second chambers for preventing transfer of vibrations between the chambers and for sealing a passage between the first and second chambers, the coupling comprising:

5 a first flange adapted to be attached to the first chamber and having a first internal conduit and an inner periphery;

a second flange adapted to be attached to the second chamber and having a second internal conduit in alignment with said first internal conduit to thereby form the passage between the first and second chambers, said second flange having an outer periphery in
10 opposed relationship to said inner periphery of said first flange to thereby define a space between said first and second flanges which is in flow communication with said first and second internal conduits; and

a looped diaphragm having an outer peripheral edge region secured to said first flange and an inner peripheral edge region secured to said second flange to thereby couple
15 said first and second flanges together and close said space between said first and second flanges in order to seal said first and second internal conduits from the ambient atmosphere.

2. The coupling of claim 1, wherein said diaphragm includes a middle portion
20 arranged between said inner and outer peripheral edge regions and is attached to said first and second flanges such that said middle portion is arranged between said first and second flanges.

3. The coupling of claim 2, wherein said middle portion of said diaphragm has
25 a bell-shape in a radial cross-section.

4. The coupling of claim 1, wherein said diaphragm is flexible.

5. The coupling of claim 1, wherein said diaphragm comprises at least one elastomer layer.

6. The coupling of claim 5, wherein said at least one elastomer layer is made of VITON™.

7. The coupling of claim 5, wherein said diaphragm further comprises reduction means for reducing at least one of the permeability and out-gassing of said at least one elastomer layer.

8. The coupling of claim 5, wherein said diaphragm further comprises an aluminum coating arranged on said at least one elastomer layer.

9. The coupling of claim 5, wherein said diaphragm further comprises a polymer coating arranged on said at least one elastomer layer.

10. The coupling of claim 1, wherein said diaphragm further comprises reinforcement means for strengthening said diaphragm without increasing stiffness of said diaphragm.

11. The coupling of claim 1, wherein said at least one elastomer layer comprises first and second elastomer layers, said diaphragm further comprising a fabric layer interposed between said first and second elastomer layers.

12. The coupling of claim 1, wherein said at least one elastomer layer comprises first and second elastomer layers, said diaphragm further comprising a fabric layer interposed between said first and second elastomer layers, an aluminum coating

arranged on outer surfaces of said first and second elastomer layers and a polymer coating arranged on said aluminum coating.

13. The coupling of claim 1, wherein said first flange has an inner peripheral wall defining a portion of said inner periphery and said second flange has an outer peripheral wall defining a portion of said outer periphery and in opposed relationship to said inner peripheral wall of said first flange to thereby define a portion of said space between said first and second flanges.

14. The coupling of claim 13, wherein said diaphragm includes a middle portion arranged between said inner and outer peripheral edge regions and is attached to said first and second flanges such that said middle portion is arranged between said inner and outer walls.

15. The coupling of claim 14, wherein said middle portion of said diaphragm has a bell-shape in a radial cross-section, with one side of said bell-shaped middle portion being arranged opposite said inner wall and an opposite side of said bell-shaped middle portion being arranged opposite said outer wall.

16. The coupling of claim 1, further comprising clamps for securing said outer and inner peripheral edge regions of said diaphragm to said first and second flanges, respectively.

17. The coupling of claim 16, further comprising screws for attaching said clamps to said first and second flanges with said diaphragm sandwiched between said clamps and said first and second flanges.

18. The coupling of claim 16, wherein said clamps comprise a first pair of clamps attached to said first flange and a second pair of clamps attached to said second flange.

5 19. A coupling between first and second chambers for preventing transfer of vibrations between the chambers and for sealing a passage between the first and second chambers, the coupling comprising:

a first flange adapted to be attached to the first chamber and having a first internal conduit;

10 a second flange adapted to be attached to the second chamber and having a second internal conduit in alignment with said first internal conduit to thereby form the passage between the first and second chambers, said second flange being separated from said first flange such that a space is defined between said first and second flanges in flow communication with said first and second internal conduits; and

15 a diaphragm comprising at least one elastomer layer and which is secured to said first and second flanges to thereby couple said first and second flanges together and close said space between said first and second flanges in order to seal said first and second internal conduits from the ambient atmosphere.

20 20. The coupling of claim 19, wherein said at least one elastomer layer is made of VITON™.

21. The coupling of claim 19, wherein said diaphragm further comprises an aluminum coating arranged on said at least one elastomer layer.

25 22. The coupling of claim 19, wherein said diaphragm further comprises a polymer coating arranged on said at least one elastomer layer.

23. The coupling of claim 19, wherein said at least one elastomer layer comprises first and second elastomer layers, said diaphragm further comprising a fabric layer interposed between said first and second elastomer layers.

5 24. The coupling of claim 19, wherein said at least one elastomer layer comprises first and second elastomer layers, said diaphragm further comprising a fabric layer interposed between said first and second elastomer layers, an aluminum coating arranged on outer surfaces of said first and second elastomer layers and a polymer coating arranged on said aluminum coating.

10 25. The coupling of claim 19, wherein said diaphragm has an inner peripheral edge region secured to said first flange and an outer peripheral edge region secured to said second flange.

15 26. The coupling of claim 25, wherein said diaphragm has a middle portion between said inner and outer peripheral edge regions which is arranged in said space between said first and second flanges.

20 27. The coupling of claim 26, wherein said middle portion of said diaphragm arranged in said space between said first and second flanges has a bell-shape in a radial cross-section, with one side of said bell-shaped portion being arranged opposite said first flange and an opposite side of said bell-shaped middle portion being arranged opposite said second flange.

25 28. The coupling of claim 19, wherein said first flange has an inner periphery and said second flange has an outer periphery in opposed relationship to and spaced from said inner periphery of said first flange, a portion of said diaphragm being arranged

between said first and second flanges.

5 29. The coupling of claim 19, wherein said first flange has an inner peripheral wall and said second flange has an outer peripheral wall in opposed relationship to and spaced from said inner wall of said first flange, a portion of said diaphragm being arranged between said first and second walls.

10 30. The coupling of claim 19, wherein said diaphragm is in the form of a loop having a radial thickness and has an outer radial edge region secured to said first flange and an inner radial edge region secured to said second flange.

15 31. A metrology system for inspecting wafers, comprising:
a floating inspection chamber maintained at vacuum pressure;
a fixed transfer chamber interposed between ambient atmosphere and said inspection chamber and subjected to alternating depressurization and repressurization;
a gate valve arranged between said inspection chamber and said transfer chamber for controlling flow communication through a passage between said inspection chamber and said transfer chamber; and
20 a coupling arranged between said inspection chamber and said transfer chamber for preventing transfer of vibrations between said inspection chamber and said transfer chamber, and for sealing said passage between said inspection chamber and said transfer chamber,

25 said coupling comprising:
a first flange connected to said inspection chamber and having a first internal conduit and an inner periphery;
a second flange connected to said gate valve and having a second internal

conduit in alignment with said first internal conduit to thereby form said passage between said inspection chamber and said transfer chambers, said second flange having an outer periphery in opposed relationship to said inner periphery of said first flange to thereby define a space between said first and second flanges which is in flow communication with said first and second internal conduits; and

a looped diaphragm having an outer peripheral edge region secured to said first flange and an inner peripheral edge region secured to said second flange to thereby couple said first and second flanges together and close said space between said first and second flanges in order to seal said first and second internal conduits from the ambient atmosphere.

32. A metrology system for inspecting wafers, comprising:
a floating inspection chamber maintained at vacuum pressure;
a fixed transfer chamber interposed between ambient atmosphere and said inspection chamber and subjected to alternating depressurization and repressurization;
a gate valve arranged between said inspection chamber and said transfer chamber for controlling flow communication through a passage between said inspection chamber and said transfer chamber; and
a coupling arranged between said inspection chamber and said transfer chamber for preventing transfer of vibrations between said inspection chamber and said transfer chamber, and for sealing said passage between said inspection chamber and said transfer chamber,

said coupling comprising:
a first flange connected to said inspection chamber and having a first internal conduit;
a second flange connected to said gate valve and having a second internal conduit in alignment with said first internal conduit to thereby form the passage between

said inspection chamber and said transfer chamber, said second flange being separated from said first flange such that a space is defined between said first and second flanges in flow communication with said first and second internal conduits; and

5 a diaphragm comprising at least one elastomer layer and which is secured to said first and second flanges to thereby couple said first and second flanges together and close said space between said first and second flanges in order to seal said first and second internal conduits from the ambient atmosphere.